monthly snowfall. The isotherms of minimum 32° and 40° are also shown on this chart.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 5. Arizona, 16, 29. Arkansas, 5. California, 18. Colorado, 2 10, 14, 15, 21, 29. Idaho, 13, 18, 19, 20. Illinois, 3, 4. 6, 15, 16, 25. Indiana, 13. Iowa, 3, 5, 6, 15, 20, 21. Kansas, 4, 6, 8, 9, 22. Maine, 14. Maryland, 9, 10, 29, 30. Massachusetts, 11. Michigan, 28. Minnesota, 5, 6, 8, 10, 17, 28. Missouri, 3, 4, 6, 28. Montana, 6, 13, 19, 20. Nebraska, 5, 20, 21, 22. Nevada, 18, 20. New Hampshire, 11, 14. New York, 7, 12, 15, 20, 30. North Dakota, 2, 21, 24. Ohio, 7, 12, 29, 30. Oklahoma, 6. Oregon, 10, 13, 19, 20. Pennsylvania, 9, 10, 30. Rhode Island, 9. South Dakota, 2, 5. Tennessee, 4, 6, 13, 16. Utah, 14, 17. Vermont, 11. Virginia, 19. Washington, 4, 16, 19. West Virginia, 9, 19. Wisconsin, 10, 15, 22, 25, 28.

SLEET.

The following are the dates on which sleet fell in the respective States:

Colorado, 21, 22. Idaho, 20, 21. Kansas, 22. Michigan, 29, 30. Minnesota, 28, 29. Montana, 19, 20. Nebraska, 21. Nevada, 20. New York, 27, 30. Ohio, 30. Pennsylvania, 30. Utah, 21.

WIND.

The *prevailing winds* for September, 1895, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table IX. These latter resultants are also shown graphically on Chart II, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

HIGH WINDS.

Maximum wind velocities of 50 miles or more per hour were reported at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Amarillo, Tex	21	52	s.	Oklahoma, Okla	6	52	n.
Do	28	50	n.	Pierre, S. Dak	19	52	w.
Chicago, Ill	4	53	s.	St. Paul, Minn	6	55	sc.
Do	22	50	s.	Tatoosh Island, Wash	19	58	nw.
Huron, S. Dak	5	61	se.	Williston, N. Dak	24	52	w.
Marquette, Mich	5	52	sc.	Winnemucca, Nev	11	50	sw.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends largely upon the absorption by the atmosphere, and varies with the distribution of cloudiness. The sunshine is now recorded automatically at 15 regular stations of the Weather Bureau by its photographic, and at 22 by its thermal effects. At one station records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric sheets show seventy-fifth meridian time. For convenience the results are all given in Table XI for each hour of mean local time. The cloudiness is determined by numerous personal observations at all stations during the daytime, and is given in the column of "average cloudiness" in Table I; its complement or clear sky is given in the last column of Table XI.

COMPARISON OF SUNSHINE AND CLEAR SKY.

The sunshine registers give the *duration* of direct sunshine whence the percentage of possible sunshine is derived; the observer's personal estimates give the percentage of *area* of clear sky. These numbers have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental record of percentage of duration of sunshine is almost always larger than the observers' personal estimate of percentage of area of clear sky; the average excess for September, 1895, is 8 per cent for photographic records, and 11 per cent for thermometric records. The details are shown in the following table:

Difference between instrumental and personal observations of sunshine.

Photographic stations.	Instrumental.	Personal.	Difference.	Thermometric stations.	Instrumental.	Personal.	Difference.
Denver, Colo	89	74	15	Vicksburg, Miss	90	84	14
Phœnix, Ariz.	89	77	12	Chicago, Ill	86	71	15
Santa Fe, N. Mex	86	75	11	Cincinnati, Ohio	86	67	19
Dodge City, Kans.	84	77	7	Des Moines, Iowa	84	67	17
Kansas City, Mo.	78	73	5	New Orleans, La	83	83	0
San Diego, Cal.	77	73	5	St. Louis, Mo	82	66	16
Washington, D. C.	77	72	5	Philadelphia, Pa	81	58	23
Galveston, Tex.	76	67	9	Little Rock, Ark	80	61	19
Salt Lake City, Utah*	75	57	18	Baltimore, Md.	78	73	5
Savannah, Ga	75	67	8	Louisville, Ky	77	63	14
Bismarck, N. Dak	63	58	5	Wilmington, N. C.	74	75	— 1
Cleveland, Ohio	59	50	9	Detroit, Mich.	73	61	12
Eastport, Me	59	49	10	Atlanta, Ga.	72	74	— 2
Helena, Mont.	57	58	— 1	New York, N. Y	72	66	6
Portland, Oreg. †	48	44	4	Portland, Me	69	55	14
				Boston, Mass	68	57	11
				Rochester, N. Y.	67	58	9
				San Francisco, Cal	63	60	3
				Columbus, Ohio	61	48	13
				Buffalo, N. Y.	59	46	13
				Marquette, Mich	59	41	18
				Portland, Oreg. †	44	44	0

* No thermometric report. † Records kept by both methods.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table X, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

The dates on which reports of thunderstorms for the whole country were most numerous were: 12th, 143; 15th, 127; 26th, 177.

Thunderstorm reports were most numerous in: Florida, 156; Illinois, 143; Massachusetts, 126; Minnesota, 136; Ohio, 173.

Thunderstorms were most frequent in: Florida, 25 days; Louisiana, Michigan, and Minnesota, 22; Illinois, 20.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 1st to the 7th, inclusive, and also the 29th and 30th. On the remaining twenty-one days of this month 200 reports were received, or an average of about ten per day. The dates on which the reported number especially exceeded this average were: 14th, 31; 15th, 34; 16th, 44; 17th, 43; and 29th, 28.

Auroras were reported by a large percentage of observers

in: North Dakota, 34 per cent; Maine and Minnesota, 72; Montana, 53; Wisconsin, 39.

Auroras were reported most frequently in: Minnesota, on 14 days; North Dakota and Wisconsin, 11; Montana, 8; New York and South Dakota, 7.

CANADIAN DATA—THUNDERSTORMS AND AURORAS.

Auroras were reported as follows: 2d, Quebec. 4th, Qu'Appelle. 14th, Halifax, Quebec, Montreal, Winnipeg, Minnedosa, Qu'Appelle, Calgary, and Prince Albert. 15th, Grindstone, White River, Minnedosa, Qu'Appelle, and Prince Albert. 16th, Montreal, Port Arthur, and Winnipeg. 17th, Quebec, Port Arthur, Winnipeg, and Minnedosa. 18th, Quebec, Winnipeg, Minnedosa, Qu'Appelle, Swift Current, and Prince Albert. 19th, Charlottetown and Port Arthur. 20th, White River. 23d and 24th, Minnedosa. 29th, Toronto, Minnedosa, and Prince Albert. 30th, Port Arthur, Winnipeg, and Prince Albert.

Thunderstorms were reported as follows: 2d, Winnipeg, Minnedosa, and Qu'Appelle. 4th, Rockliffe, White River, Port Stanley, and Port Arthur. 6th, Calgary. 7th, Rockliffe and Toronto. 9th, Port Stanley. 10th, White River and Parry Sound. 11th, Montreal, Rockliffe, and Parry Sound. 12th, Toronto and Port Stanley. 15th, Port Arthur. 16th, Port Stanley. 17th, Winnipeg and Qu'Appelle. 18th, Toronto, Saugeen, and Parry Sound. 19th, Port Stanley and Esquimalt. 20th, Rockliffe, White River, and Minnedosa. 21st, Yarmouth. 22d, Father Point. 23d, Father Point and White River. 25th, Toronto. 26th, Grand Manan, St. Andrews, Port Stanley, and Saugeen. 27th, Charlottetown and Battleford. 28th and 30th, Battleford.

INLAND NAVIGATION.

The *extreme and average stages of water* in the rivers during the current month are given in Table VII, from which it will be seen that no river has attained the danger line; the nearest approaches were the high water in the Arkansas River on the 13th and 15th. The unusual stage of low water that has continued to prevail during September in the upper Mississippi, the Missouri, and Ohio rivers and their tributaries, is shown by the figures given in the column showing the lowest stage of water. As a rule, the zeros of the Weather Bureau gauges are put at, or slightly below, the lowest water on record, and in several cases it will be noticed that the rivers have, during the month, receded to, or below, this lowest previous record.

METEOROLOGY AND MAGNETISM.

By Prof FRANK H. BIGELOW.

For general remarks relative to this subject see page 7 of the REVIEW for January, 1895.

The comparison of the air temperature with magnetic horizontal force is shown in detail on Chart V, and the special features of the September curves are as follows:

SPECIAL FEATURES FOR SEPTEMBER.

The correction for slope is + 1° for each group of temperature stations; the reduction to a normal base line is — 8°. The reduction of the horizontal force variations to a mean base line is + 12. The temperature and pressure data are each set back one day to allow for the eastward drift.

STATE WEATHER SERVICES.

By JAMES BERRY, Chief of State Weather Service Division.

The following extracts in regard to the general weather conditions in the several States and Territories are taken from the monthly reports of the State Weather Services.

Snowfall and rainfall are expressed in inches.

Alabama.—The average temperature for the northern section was 76.8°; southern section, 79.4°; and State, 78.1°. The maximum, 101°, occurred at Goodwater on the 23d, and the minimum, 34°, at Valley Head on the 30th. Frost occurred in central and northern portions on the 29th and 30th. Nearly all the rain occurred in the first week. Total average amount was 1.48, or 1.26 below normal.

Arizona.—The mean temperature, 77.1°, or about 3.5° above normal. The highest reported, 115°, occurred at Maricopa, and the lowest, 26°, at Whipple Barracks. The average total precipitation was 1.22, or only 0.02 less than normal. The greatest amount, 3.00, was reported from Mount Huachuca, while several stations reported "no rain."

Arkansas.—The weather was unfavorable for all agricultural pursuits except saving hay and fodder. The mean temperature was 77.1°, or 4.6° above the average, and the highest on record. The maximum, 105°, which occurred at Helena on the 13th, exceeded the previous record, and the minimum, 32°, at Corning on the 30th, equaled it. The period from the 9th to 22d, inclusive, was the warmest experienced for the past seventeen years, the average excess being 10°. The last three days were cooler than the normal by 10°. Frosts occurred on the 24th, 27th, 28th, 29th, and 30th, at one or more stations. The average total precipitation was 1.38, or 1.74 less than normal. Precipitation was local in character and badly distributed. The greatest amount, 3.88, was reported at Camden, and the least, 0.03, at Searcy. A brilliant meteor was observed at 9 p. m., on 25th at Bee Branch, Kirby, Little Rock, Lonoke and Rison. Hail was reported at Corning on 5th.

California.—The average temperature was 65.1°, or 4.7° less than normal; highest, 115°, reported from Volcano Springs, and the lowest, 6°, at Bodie. Average precipitation, 1.44, or 1.23 in excess of normal. The greatest amount, 9.57, was reported from Upper Mattole, and the least, 0.00, at a few stations in the southern portion. Frosts were reported on the 3d, 4th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22d, 23d, and 24th.

Colorado.—The mean temperature was 61°, or 3° above the normal. The highest temperature, 105°, was reported from Julesburg on the 17th, and the lowest, 0°, at Gulch on the 21st. Freezing temperatures prevailed generally on the 22d and 23d. The mean precipitation was 0.55, or 0.35 below the average. The first twenty days the fall was light. On the 21st a heavy snowstorm occurred generally over the eastern Slope, 11.4 being recorded at Denver, which is the largest in September during a period of 25 years.

Connecticut.—(See *New England.*)

Delaware.—(See *Maryland.*)

District of Columbia.—(See *Maryland.*)

Florida.—From the 1st to 15th, inclusive, showers were well distributed but in some cases excessive, particularly over portions of the western and southern districts. Many stations, however, during this period complained of lack of moisture. From the 15th, and including the last decade, there was less rain. During the last week there was little except a few badly distributed showers, and reports show that much damage was sustained, especially among early gardens. The mean temperature was 79.5°, or 0.2° above the average. The highest temperature, 96°, was reported at Kissimmee on the 1st and 2d, and the lowest, 57°, at Pensacola and Tallahassee on the 30th. The average amount of precipitation was 4.77, or 2.27 less than normal. The greatest fall, 9.13, occurred at Hypoluxo, and the least, 1.14, at Lake City.

Georgia.—The month was as noticeable for its dryness as the preceding one for its excessive moisture. The total rainfall in some sections did not exceed half an inch. The average amount for the State was 1.53, or 2.61 less than the normal. It was excessively hot until near the close of the month, when a cool wave spread over the State, lowering the temperature very decidedly but not sufficiently to cause frost except in a few exposed places in the extreme northern counties.

Idaho.—The mean temperature was 53.3°. The highest temperature, 96°, was recorded at Idaho City on the 29th, and the lowest, 8°, at Chesterfield on the 22d. Severe frosts accompanied by freezing temperatures occurred on the 6th over the southern section. Frosts were frequent during the latter part of the month. That of the 22d was exceptionally severe, and effectually stopped growth of vegetation over the greater portion of the State. The average precipitation was 1.44. The greatest amount, 4.31, was recorded at Murray, and the least, 0.20, at Lake.

Illinois.—The mean temperature was 70.7°, or 5.3° above the normal. The highest temperature, 102°, was recorded at Holts on the 17th, and the lowest, 24°, at Oswego on the 30th. It is probable that the last day of the month gave the lowest temperature ever recorded in September within the State. Frost was quite general over the central and northern counties on the 24th, and again on the 27th, 29th, and 30th. On the latter date thin ice formed in most north-central and northern